



COLOR &
APPEARANCE

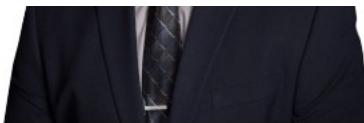


CAD NEWS®

FALL 2021 NEWSLETTER



**FALL 2021
CHAIRMAN'S**



MESSAGE

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Hello and let me first express my sincere appreciation for being this year's Chairperson and looking forward to the challenges this position holds.

I would like to start off by thanking Mark Freshwater for

We have been through many changes both physically and emotionally over the last 18 months or so and just going through the daily ups and downs is so draining. We have seen supply chain disruptions throughout all industries and plastics is most definitely not been left unscathed. Everyone dealing with it in their own ways but as an industry we will pull through stronger and more versatile than ever.

This Spring the Membership of CAD voted in two new members to the CAD Board of Directors and re-elected 7 incumbents. We want to welcome in Brian Coleman and Josh Jacobs to the BOD. A list of the election results can be found in this issue.

As always, we would like to thank the sponsors of this year's RETEC. These sponsorships are what allows us to put on the RETEC conference as well as give scholarships to college students and support programs like the Plastivan. All successful because of the support of these sponsors. They are recognized in this issue so please use the links and find out more of what they do for our Membership.

I would also like to thank the sponsors of the Newsletter for their continued support of the Newsletter so please visit their websites and find out more of what they can

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ANNUAL SPE CAD SURVEY RAFFLE

We are looking for gifts to use for the SPE CAD Survey Raffle that will be given away at the end of the conference.

We are looking for gifts to add for the SPE CAD Survey. Prizes that will be given away at the end of the conference proceedings. If you have a prize of \$25 or more and want to supply for the raffle, please contact:

Chuck DePew or +1 765-914-3363

INVITATION TO ATTEND CAD BOARD MEETING

The Color and Appearance Division (CAD) holds 4 Board of Directors (BOD) meetings each year, in person or virtually. Any CAD members in good standing with in SPE and has Color and Appearance as their selected division are welcomed to attend these meetings. If interested in attending the meetings, please contact the current CAD Chairperson or any BOD for more information.



Milliken presents

Milliken: The Color Experts

Milliken & Company understands the power and value of color as it relates to branding. Humans are visual creatures and color plays a key role in purchasing decisions, as it helps to inform, personalize and speak the brand language.

The company continues to tap into its vast experience in this space to develop solutions for a wide variety of end markets and end-use applications.

Milliken's color journey began in 1964, when it launched its proprietary Versatint® washable colorants for textile identification. In 1981, it introduced its Reactint® range of colorants for polyurethane (PU). Five years later, Milliken unveiled its ClearTint™ polymeric colorants for use in NX® UltraClear™ polypropylene (PP), which can be made only with its Millad® NX® 8000 clarifier.

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Additionally, Milliken continues to keep its finger on the pulse of end-user and market trends, which it documents each year in its ColorDirection report that forecasts the key shades and hues for the coming year. In doing so, it offers a palette of carefully curated colors, while providing the stories behind the inspi-



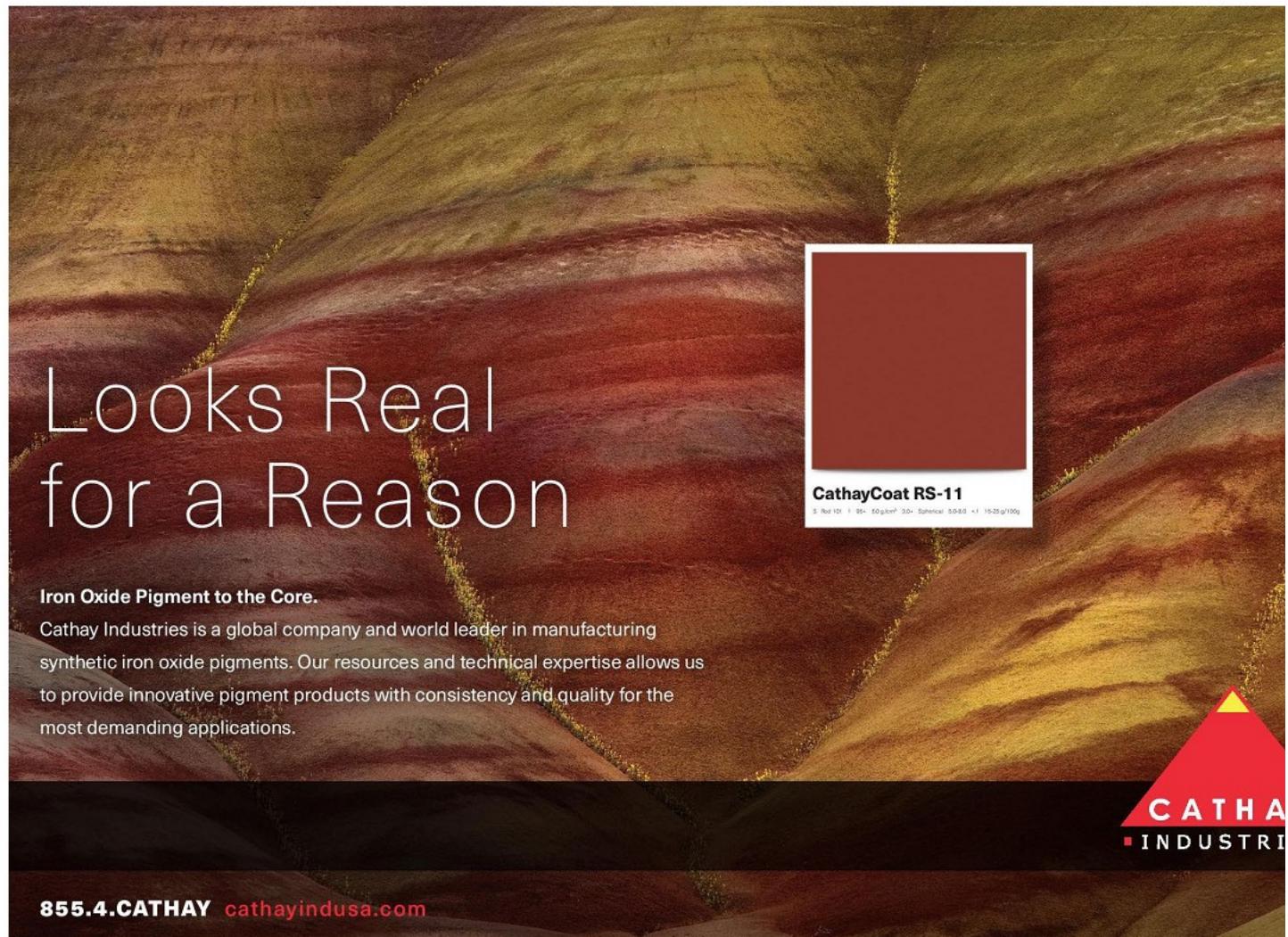
Milliken's diverse portfolio of colorants can enable product makers to realize their aims to deliver on those colors. This will help drive and shape consumer preferences in the coming year.

From the R&D lab to the produc-

The year 2019 marked a major step forward, with the introduction of both its

providing the stories behind the inspiration and motivation driving their popularity. Brand owners can leverage this

From the R&D lab to the production floor, Milliken's Chemical Division is ready to help customers leverage



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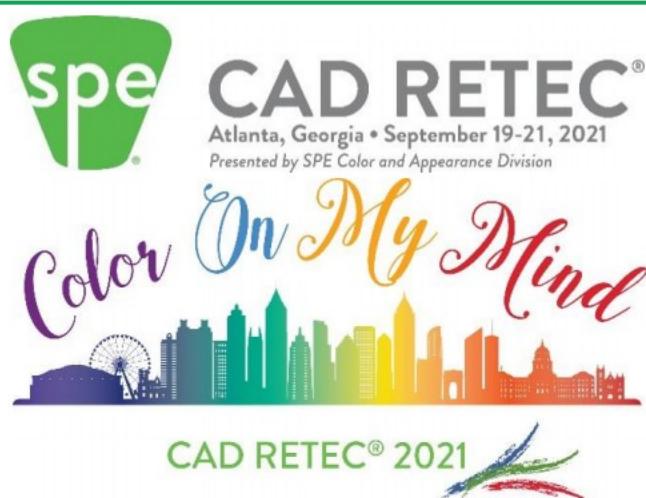
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Pre-registration online Go to [2021 CAD RETEC HOME](#)



Onsite Registration

- Sunday 19 September 1:00 PM – 7:00 PM
- Monday 20 September 7:30 AM – 5:00 PM
- Tuesday 21 September 7:30 AM – 3:00 PM

Preconference Tutorial [Coloring of Plastics](#)

Presented by Bruce Mulholland, SPE Fellow
Sunday 19th September 8:00 AM – 4:30 PM

Fee: \$525 (Must Pre-register for event. Extra fee not included with CAD RETEC® 2021 registration)

CAD RETEC® 2021 Golf Outing



Sunday September 19th, 2021

Beamer Park Atlanta



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(SELECT ONLY ONE TYPE OF REGISTRATION)

SPE Member **2021**

- Advance \$410
- Late / Onsite (After 8/20/21) \$510

SPE Non-Member:

- Advance \$630
- Late/Onsite (After 8/20/21) \$730

OTHER Registration Types:

- Speakers/Moderator \$190
- Student (w/ Valid Student ID): \$ 50
- Emeritus: \$100
- Tabletop advanced registration \$1,350

- Tabletop advanced registration
- Tabletop late reg (After 8/20/21)

\$1,550



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WELCOME RECEPTION

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Atrium A703 – A704

Sunday, September 19th

6:00pm – 8:00pm

Join us for cocktails, networking, light snacks.

Complimentary with Registration

Use the GREEN drink tickets.

5K Fun Run/Walk To benefit Habitat for Humanity

Tuesday, September 21st

Marriott Marquis Lobby at 7:00am

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EVENT COORDINATOR: Ashley Miller

EVENT SPONSOR: DCL

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Exhibit Schedule

Atrium Ballroom B & C

Monday, Sep 20th

10:00 am to 7:00 pm

Monday Breakfast

Sponsored by DCL

Atrium A703 – A704

Monday, September 20th

7:00am

Complimentary with registration!

Networking Reception

Sponsored by Shepherd Chemical

Atrium Ballroom B & C

Monday, Sep 20th

5:30 pm – 7:00 pm

Use the GOLD tickets for drinks!



CAD RETEC®

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Technical Program, Atrium A Monday 20 September 2021

Time	Category	Speaker/Company	Title/Sponsor
7:00-8:00 AM	Breakfast	Atrium A703-A704	Sponsored by DCL

7:00-8:00 AM	Breakfast	8:00-8:45 AM	Sponsored by DCL
8:45 AM	Opening Remarks	Kim Williamson / Techmer PM	Welcome to CAD RETEC® 2021 in GA
9:00 AM	Keynote	Doreen Becker / Ampacet	Sustainability for Colors 2.0
9:30 AM	Paper	Nathan Karszes / Ferro	Leveraging Pigments' NIR Reflective Properties to Overcome the Challenges of Sorting Recyclable Black Plastic
10:00 AM	Break	Exhibits open (Exhibitors) Atrium Ballroom B & C	Sponsored by Clariant Color Solutions
10:30 AM	Paper	Frank Neuber / Clariant	Fully Sustainable Micronized White Pigments to Improve Dispersion in Engineering Polymers
11:00 AM	Paper	Eric Andrews / Colour Synthesis Solutions	Evaluating the Influence of Color on Plastic Additives & Degradation

Technical Program, Gold Room

Tuesday 21 September 2021

Time	Category	Speaker/Company	Title/Sponsor
7:00 AM	Activity	Fun Run/Walk Hotel lobby	Sponsored by DCL
8:45 AM	Opening Remarks	Kim Williamson / Techmer PM	Welcome Day 2
9:00 AM	Paper	Andrew Yankosky / Sun Chemical	Pigment Lightfastness - A Comparison of Fluorescent Bulb (Fluorescent Deluxe Daylight) and Light Emitting Diode Array (LED) Exposure
9:30 AM	Paper	Fang Wang / Sun Chemical	Pigment Dispersion Quality Assessment and Application Suitability Analysis
10:00 AM	Break	Exhibit Area Atrium Ballroom B & C	Sponsored by EMD Electronics
10:30 AM	Paper	Joseph Fay / BASF	Maintaining Outdoor Plastics Appearance: Sunlight or UV-A's or Both? Or Nothing?
11:00 AM	Paper	Thomas R. Maier / Monolith	The New Plasma Black: Performance and Environmental Benefit
11:30 PM	Luncheon	Awards Luncheon Atrium A703 – A704	Sponsored by Tronox



CAD RETEC®





New Technology Forum

Monday 20 September 2021

Time	Company
4:35	Milliken
4:40	Colour Synthesis
4:45	The Shepherd Color Company
4:50	Tronox
4:55	Datacolor
5:00	Sudarshan
5:05	Clariant
5:10	DCL Corporation
5:15	Birla Carbon
5:20	Silberline
5:25	EMD Electronics
5:30	Sun Chemical



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CAD RETEC® 2021 Exhibitors

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3V Sigma USA	Leistritz Extrusion
Barentz	Liberty Specialty Chemicals
Birla Carbon	Lintech International LLC
CW Brabender	Milliken & Company
Cathay Industries USA	MIXACO USA
CINIC America	Omya
Clariant Colorants Solutions	Palmer Holland Inc.
Colour Synthesis Solutions	Paramount Colors Inc.

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SPE CAD NEWS

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2021 CAD RETEC® GOLF OUTING

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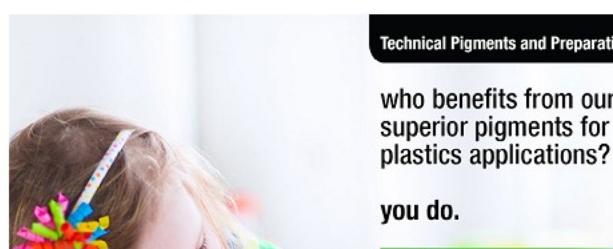
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Abstract

Material selection during the design phase can dictate a final part's ability to be recycled. This paper looks at an appearance part that transformed three different material solutions into a single material solution such that the final part was now recyclable and produced at lower cost. A look at the technical challenges and solutions to achieve this result is included.

Background: Initial Design

In many cases, designers and part engineers select materials based on past successful designs and minimize risk. Their selection can be based on material properties themselves, past part performance, ease of applying secondary operations, or other factors. The part design as the subject of this paper was no exception.

The specific part discussed in this paper was a new engine badge design for the 2019 model year Ford F-150 Raptor pickup truck. The newly designed engine cover would include lo

Figure 1



Figure 2



Figure 3



Figure 4



Sustainability

This paper by no means is intended to be a dissertation on plastics sustainability. There is much published on recycling and re-use, or biopolymers, or compostable

Design for Sustainability

As mentioned earlier, the initial design of this badge has two different materials and three different secondary processes making the part not conducive

To eliminate the complexity of the initial design, the concept employed was to produce all three components from the same molded-in-color resin. This would eliminate the three secondary operations and would lower the final part cost. Because this part is under the hood, PA6 was chosen as the base resin for good thermal stability, good colorability, and good overall aesthetics for this appearance part. The remainder of this paper discusses the technical challenges and solutions to achieve the red letters, the silver letters, and the brushed bronze base plate appearance all produced from the same resin.

Paint Elimination: Red Letters

At the outset, formulating a precolored PA6 in red for the letters to spell “Performance” doesn’t sound too challenging. The two main material requirements are initial color quality and resistance to discoloration over time due to heat of the engine. In PA6, the two main formulation elements to achieve these criteria are colorant selection and base resin heat stabilizer formulation.

Colorant selection is relatively straightforward for this application. The desired color is a high chroma race red color. With the color stability requirement, we quickly ruled out dyes for this application and were left with only a few options of high performance organic pigments to choose from. Having made this selection, color formulation was quickly completed to achieve the desired paint color.

For color stability of PA6 in high temperature environments, it is well known that typical inorganic heat stabilizer systems based on copper iodine additives will

Fortunately, much work had been undertaken in resins like acetal copolymer to improve the appearance of the moldings to reduce visible weld lines and increase the reflectance of the color¹. This was achieved through pigment technology, and mold design processing. Aluminum pigments are available in three forms: cornflake, lenticular (silver dollar), and spherical. Corn flake pigments are characterized by a flat pig geometry with an irregular edge. Lenticular pigments have a flatter geometry with a smooth edge. Lenticular pigments are generally brighter than corn flakes due to the smooth flat surface. Spherical pigments are round and contribute more sparkle effect than true metal effect.

Another important aspect of aluminum pigment particle size distribution. A broad particle size distribution will appear duller in color than the same average particle size product with a narrow distribution. In general, smaller particle size flakes will yield a more chrome appearance and have increased opacity. Larger flakes will have a more sparkle appearance with less opacity.

Flow lines or knit lines occur when two polymer flow fronts come together in a part. Weld lines occur when polymer flow fronts meet head-on. These defects are present due to the part design and gate location and occur in uncolored or colored resins. Surface defects may not be present with those materials, but property may be reduced due to the flow and weld lines. Metallic pigments generally create noticeable flow and weld lines causing surface defects. Orientation of metallic flakes can change the reflectivity making the flow or weld line more noticeable. Larger particle size pigments generally exhibit less noticeable flow and weld lines. A broader particle

Metal Replacement: Base Plate

The final component of this engine badge assembly to replace with PA6 was the aluminum base plate. This part was anodized with a bronze color and also had a brushed surface appearance. A complicating factor was that the base plate included irregular holes throughout the surface which could cause flow lines. The holes were irregular in size, shape and direction. The holes are used for heat staking the letters to the base plate. The random nature of the holes is used as a poka-yoke so that the letters can not be interchanged to inadvertently misspell the words. The holes were obviously important for attaching the letters to the base plate. It was also important to maintain some level of mistake proofing, particularly for the word “Performance”.

The base resin was again chosen to be PA6 with the same optimized organic heat stabilizer package used above. The bronze color was achieved to match the anodized color, but first attempts in molding yielded a part with severe flow lines due to the heat staking holes and no brushed appearance (see Figure 2). The holes were then

improved to eliminate the flow lines and maintain the brushed appearance. Eliminating the painted red letters improves durability when in contact with engine fluid cleaners. Further benefits included at least a \$2.50/unit cost savings, a \$40,000 one-time savings by not having to build painting and plating racks, and a 20 gram per part weight savings.

The all plastic molded-in-color engine badge met the appearance and part performance requirements of the OEM. But how was the all plastic appearance accepted by the consumer? A quick search on fordraptorforum found comments such as “I really think the 2019 E-Cover looks so much better than the previous year”, “Looks awesome”, or “Great looking cover”, and “the engine cover is big improvement”. From the majority of the comments, it appears that the new engine cover badge were a success. Figure 4 shows a picture of the installed final engine cover and badges.

By achieving an all plastic solution formulated with the same PA6-101 resin for the red, silver and bronze colors, the assembly represents a sustainable solution versus the initial design. We satisfied the environmental by using the same molded-in-color resin which

modified to be all circular but still random in location to maintain poka-yoke. The surface of the mold was also modified with a brushed surface texture to mimic the brushed appearance of the aluminum base plate.

The second molding trials yielded a significant improvement in appearance with almost complete elimination of the visible flow lines. The PA6 resin replicated the brushed texture in the tool to create a brushed finish very similar to the desired aluminum appearance (see Figure 3). The next iteration included

final by using the same mold in color resin while be reground, re-used, and recycled in process or end potentially keeping the final engine badge assembly the landfill. By eliminating the secondary proc thereby eliminating VOCs from painting and the che disposal associated with chrome plating and anodiz we satisfied the social pillar by reducing human risks. Finally, all of this was accomplished at a lower part cost satisfying the economic pillar.

Sustainable solutions can be rather co developing biopolymers or compostable solutions or



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